

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

GIESECKE+DEVRIENT GMBH,
GIESECKE+DEVRIENT CURRENCY TECHNOLOGY GMBH, and
PAPIERFABRIK LOUISENTHAL GMBH,
Petitioners,

v.

LUMENCO, LLC,
Patent Owner.

IPR2024-00836
Patent 10,189,294 B2

Before MEREDITH C. PETRAVICK, BENJAMIN D. M. WOOD, and
NABEEL U. KHAN, *Administrative Patent Judges*.

KHAN, *Administrative Patent Judge*.

DECISION
Granting Institution of *Inter Partes* Review
35 U.S.C. § 314

I. INTRODUCTION

A. *Background and Summary*

Giesecke+Devrient GmbH, Giesecke+Devrient Currency Technology GmbH, and Papierfabrik Louisenenthal GmbH (collectively, “Petitioner”) filed a Petition (Paper 1, “Pet.”) requesting an *inter partes* review of claims 1, 6–14, 28, and 32–39 (“the challenged claims”) of U.S. Patent No. 10,189,294 B2 (“the ’294 patent,” Ex. 1001). Lumenco, LLC (“Patent Owner”) timely filed a Preliminary Response (Paper 7, “Prelim. Resp.”).

An *inter partes* review may not be instituted “unless . . . the information presented in the petition . . . shows that there is a reasonable likelihood that the petitioner would prevail with respect to at least 1 of the claims challenged in the petition.” 35 U.S.C. § 314(a) (2018). Having considered the arguments and evidence presented by Petitioner and Patent Owner, we determine that Petitioner has demonstrated a reasonable likelihood of prevailing on at least one of the challenged claims of the ’294 patent. We institute *inter partes* review as to all the challenged claims of the ’294 patent on all the grounds of unpatentability set forth in the Petition.

B. *Related Proceedings*

The parties identify the following pending matters as involving the ’294 patent: *Lumenco, LLC v. Giesecke+Devrient GmbH*, No. 2:23-cv-00100 (E.D. Tex.); and *Lumenco, LLC v. United States*, No. 1:24-cv-00139 (Fed. Cl.). Pet. 75; Paper 5, 2.

C. *The ’294 Patent (Ex. 1001)*

The ’294 patent, titled “Arrays of Individually Oriented Micro Mirrors for Use in Imaging Security Devices for Currency and Brand Authentication,” relates to a visual display assembly useful as an authentication or anti-counterfeiting element, including a substrate and an

array of micro mirrors receiving ambient light on the surface of the substrate. Ex. 1001, codes (54), (57). The '294 patent endeavors to fill a “need for advancements in the design and fabrication of assemblies or elements that display imagery useful for anti-counterfeiting and/or product/document authentication,” allowing “new anti-counterfeiting devices or elements to be produced for use with currency, labels, credit/debit cards, and other items” that “would be much more difficult if not nearly impossible to duplicate or copy” and that “provide a surprising visual effect or ‘wow factor’ with their displayed imagery.” *Id.* at 2:15–29.

Figure 2 of the '294 patent, reproduced below, shows a side view of an object (i.e., currency, document, financial card) including an embodiment of an anti-counterfeiting or authentication element/device:

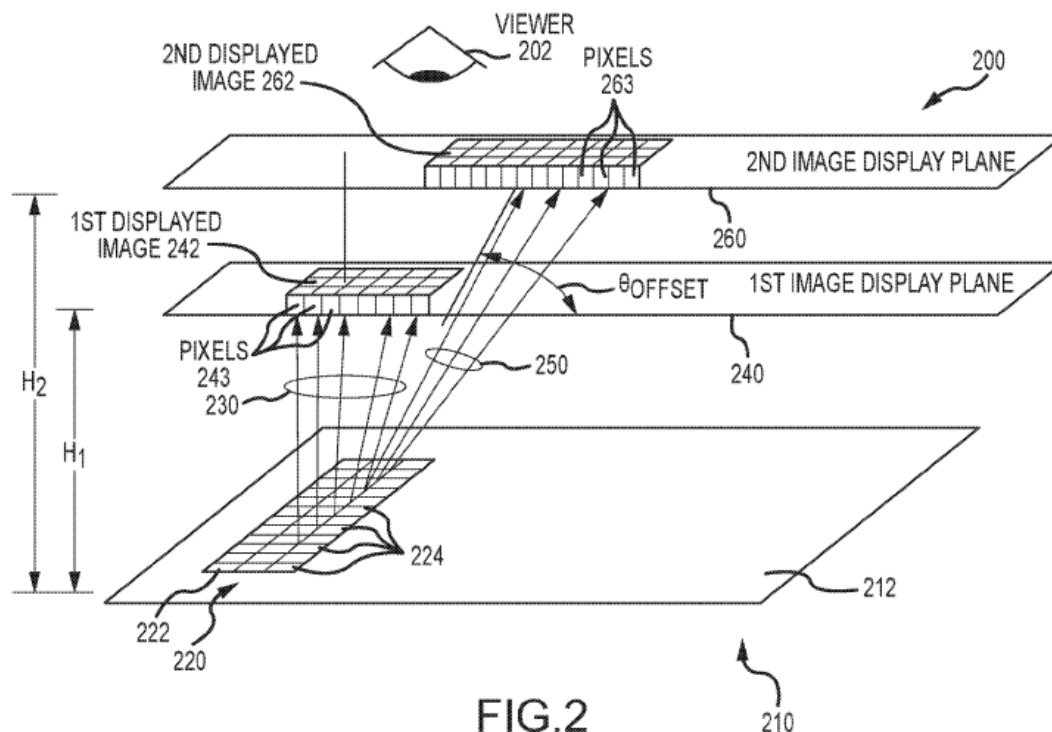


Figure 2 depicts an object (i.e., currency, document, financial card) 210 and anti-counterfeiting or authentication or security element/device 220

formed on the upper surface 212 of the object. *Id.* at 7:23–30. Security device 220 has an exposed surface 222 that provides “an array of micro mirrors 224, which may be individually oriented to provide reflection of ambient light striking the surface 222 of the security element 220 so as to display one or more floating images that can be observed by a viewer 202 to authenticate the object 210.” *Id.* at 7:30–36. “[A] first number of the micro mirrors 224 may be configured to provide sets of pixel-providing micro mirrors that reflect ambient light as shown with arrows 230 to ‘write’ or display a first image 242 made up of a plurality of pixels 243,” and “[a] second number of the micro mirrors 224 is configured to provide[] sets of pixel-providing micro mirrors that reflect ambient light as shown with arrows 250 to ‘write’ or display a second displayed image 262 made up of a plurality of pixels 263.” *Id.* at 7:37–49. As a result, the viewer 202 observes the first displayed image 242 as floating in the first image display plane 240 that is a different height above the surface 212 of the object 210 from the second displayed image 262 that appears as floating in the second image display plane 260, and the pixels 243 of the first image 242 are at a viewing angle offset from the pixels 263 of the second image 262, such that “the viewer 202 typically only views one of the floating images 242, 262 at a time.” *Id.* at 7:63–8:7.

D. Illustrative Claims

Claims 1, 28, and 35, the independent claims of the ’294 patent at issue in the proceeding, are reproduced below with limitation identifiers in brackets corresponding to claim analysis headings in the Petition. *See, e.g.*, Pet. 16–44.

[1Pre] A visual display assembly useful as a security element on paper and coin currency, and product labels, comprising:

[1a] a substrate; and

[1b.1] on a surface of the substrate, an array of micro mirrors receiving ambient light and,

[1b.2] in response, displaying an image in a plane spaced a distance apart from the surface of the substrate, wherein the image comprises a plurality of pixels and

[1b.3] wherein the array of micro mirrors includes for each of the pixels a different set of the micro mirrors each having a reflective surface oriented, in a fixed manner with a body of each of the micro mirrors rotated about at least one of first and second rotation axes extending through the body, to reflect the ambient light toward a point on the plane corresponding to one of the pixels

[1b.4] wherein each of the different sets concurrently reflect the ambient light to concurrently generate the plurality of pixels,

[1b.5] and wherein a voxel is created at each of the points on the plane via intersection of two or more beams of the reflected ambient light and

[1b.6] wherein each of the created voxels produces an effect of a point source of light floating above the surface of the substrate in the plane.

Ex. 1001, 20:46–67.

[28Pre] A visual display assembly useful as a security element on paper and coin currency, and product labels, comprising:

[28a] a substrate; and

[28b.1] on a surface of the substrate, an array of micro mirrors receiving ambient light and

[28b.2] in response, displaying a first image and a second image in a plane spaced a distance apart from the surface of the substrate at first and second viewing angles, respectively, wherein the first and second images each comprises a plurality of pixels,

[28b.3] wherein the array of micro mirrors includes for each of the pixels a unique set of the micro mirrors each having a

reflective surface rigidly oriented, by rotating a body of each of the micro mirrors about at least one of two rotations axes extending through the body, to reflect the ambient light away from the substrate toward a point on the plane corresponding to one of the pixels,

[28b.4] wherein each of the unique sets of the micro mirrors includes a number of the micro mirrors in the range of 2 to 40, and

[28b.5] wherein the reflected ambient light from the number of the micro mirrors intersects at the point corresponding to the one of the pixels to create a voxel,

[28b.6] whereby the voxel acts like a point light source positioned in the plane at the point corresponding to the one of the pixels.

Id. at 22:65–23:23.

[35Pre] A visual display assembly useful as a security element on paper and coin currency, and product labels, comprising:

[35a] a substrate; and

[35b.1] on a surface of the substrate, an array of micro mirrors receiving ambient light and,

[35b.2] in response, displaying an image in a plane spaced a distance apart from the surface of the substrate, wherein the image comprises a plurality of pixels,

[35b.3] wherein the array of micro mirrors includes for each of the pixels a different set of the micro mirrors each having a reflective surface oriented, differently from others of the micro mirrors in the different set, to reflect the ambient light away from the substrate and toward a point on the plane corresponding to one of the pixels,

[35b.4] a first set of voxels concurrently being created at the points on the plane via intersection of two or more beams of the reflected ambient light at each of the points on the plane to concurrently display the pixels of the image, wherein,

[35b.5] further in response to the receiving of the ambient light, the array of micro mirrors displays a second image in a second plane spaced a distance apart from the plane displaying the image,

[35b.6] wherein the second image comprises a plurality of pixels, and

[35b.7] wherein the array of micro mirrors includes, for each of the pixels of the second image, a different set of the micro mirrors each having a reflective surface oriented, differently from others of the micro mirrors in the different set, to reflect the ambient light away from the substrate and toward a point on the second plane corresponding to one of the pixels of the second image,

[35b.8] a second set of voxels concurrently being created at the points on the second plane via intersection of two or more beams of the reflected ambient light at each of the points to concurrently display the pixels of the second image.

Id. at 24:4–41.

E. Evidence

The Petition relies on the following references:

Reference	Exhibit No.
DE 10 2010 048 262 A1; filed Oct. 12, 2010; published Apr. 12, 2012 (“Fuhse262”).	1006
US 10,639,925; filed May 4, 2016; issued May 5, 2020 (“Fuhse925”).	1008
US 2014/0367957 A1; filed June 13, 2014; published Dec. 18, 2014 (“Jordan”)	1009
US 2013/0093172 A1; filed Dec. 3, 2010; published Apr. 18, 2013 (“Fuhse172”)	1035

Petitioner also relies on the Declaration of Lambertus Hesselink, Ph.D. (Ex. 1003) in support of its arguments. The parties rely on other exhibits as discussed below.

F. Asserted Grounds of Unpatentability

Petitioner asserts that claims 1, 6–14, 28, and 32–39 would have been unpatentable on the following grounds:

Ground	Claim(s) Challenged	35 U.S.C. §	Reference(s)/Basis
1	1, 6–13, 28, 32, 33, 35–38	103	Fuhse262
2	1, 6–13, 28, 32, 33, 35–38	103	Fuhse262, Fuhse925
3	1, 6–13, 28, 32, 33, 35–38	103	Fuhse262, Jordan
4	1, 6–13, 28, 32, 33, 35–38	103	Fuhse262, Fuhse925, Jordan
5	14, 34, 39	103	Fuhse262, Fuhse172
6	14, 34, 39	103	Fuhse262, Fuhse925, Fuhse172
7	14, 34, 39	103	Fuhse262, Jordan, Fuhse172
8	14, 34, 39	103	Fuhse262, Fuhse925, Jordan, Fuhse172

II. ANALYSIS

A. Principles of Law

Petitioner bears the burden of persuasion to prove unpatentability of the claims challenged in the Petition, and that burden never shifts to Patent Owner. *Dynamic Drinkware, LLC v. Nat’l Graphics, Inc.*, 800 F.3d 1375, 1378 (Fed. Cir. 2015).

A patent claim is unpatentable under 35 U.S.C. § 103 if the differences between the claimed invention and the prior art are such that the claimed invention as a whole would have been obvious before the effective filing date of the claimed invention to a person having ordinary skill in the art to which the claimed invention pertains. The question of obviousness is

resolved on the basis of underlying factual determinations including: (1) the scope and content of the prior art; (2) any differences between the claimed subject matter and the prior art; (3) the level of skill in the art; and (4) any objective evidence of obviousness or non-obviousness¹. *Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966).

B. Level of Ordinary Skill in the Art

In determining the level of ordinary skill in the art, various factors may be considered, including the “type of problems encountered in the art; prior art solutions to those problems; rapidity with which innovations are made; sophistication of the technology; and educational level of active workers in the field.” *In re GPAC Inc.*, 57 F.3d 1573, 1579 (Fed. Cir. 1995) (internal quotation marks and citation omitted).

Petitioner’ declarant, Dr. Hesselink, opines that a person of ordinary skill in the art in the field “would have had a minimum of an undergraduate degree in electrical engineering, mechanical engineering, or physics and at least 2 years of experience in micro-optic based security features.” Pet. 12 (citing Ex. 1003, ¶¶ 68–74).

Patent Owner states that a person of ordinary skill in the art “as of the date of alleged invention in the ’294 patent, would have had an undergraduate degree in electrical engineering, mechanical engineering, physics, or a similar field and at least 2 years of experience in micro-optic based security features.” Prelim. Resp. 10.

For purposes of this Decision, we adopt Petitioner’s proposed level of ordinary skill, which is supported by Dr. Hesselink’s testimony, except that we find that the phrase “at least” in Petitioner’s proposed definition creates a

¹ Neither party has introduced any objective evidence of nonobviousness.

vague, open-ended upper bound for the level of ordinary skill, and we therefore do not adopt that aspect of the proposal. We note that there is minimal difference in the parties' two proposals and our determination with respect to the challenges in this Petition would remain the same under either party's proposed definition.

C. *Claim Construction*

We apply the same claim construction standard used in district court actions under 35 U.S.C. § 282(b), namely that articulated in *Phillips v. AWH Corp.*, 415 F.3d 1303 (Fed. Cir. 2005) (en banc). *See* 37 C.F.R. § 42.100(b) (2020).

In applying that standard, claim terms generally are given their ordinary and customary meaning as would have been understood by a person of ordinary skill in the art at the time of the invention and in the context of the entire patent disclosure. *Phillips*, 415 F.3d at 1312–13. “In determining the meaning of the disputed claim limitation, we look principally to the intrinsic evidence of record, examining the claim language itself, the written description, and the prosecution history, if in evidence.” *DePuy Spine, Inc. v. Medtronic Sofamor Danek, Inc.*, 469 F.3d 1005, 1014 (Fed. Cir. 2006) (citing *Phillips*, 415 F.3d at 1312–17). Only claim terms in controversy require express construction, “and only to the extent necessary to resolve the controversy.” *Nidec Motor Corp. v. Zhongshan Broad Ocean Motor Co.*, 868 F.3d 1013, 1017 (Fed. Cir. 2017); *see also Vivid Techs., Inc. v. Am. Sci. & Eng'g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999) (“[O]nly those terms need be construed that are in controversy, and only to the extent necessary to resolve the controversy.”).

Petitioner argues that “no claim terms require express construction to resolve the challenges here.” Pet. 13. Patent Owner “agrees that the terms

do not require construction for purposes of evaluating the Petition.” Prelim. Resp. 10.

At this stage of the proceeding, we do not see the need to expressly construe any claim terms, as the threshold question of institution can be decided without doing so.

D. Obviousness over Fuhse262 (Ground 1)

Petitioner argues claims 1, 6–13, 28, 32, 33, and 35–38 of the ’294 patent would have been obvious over Fuhse262. Pet. 13–44. Below we provide a brief overview of the prior art reference and then analyze Petitioner’s contentions in light of Patent Owner’s arguments.

1. Fuhse262 (Ex. 1006)

Fuhse262 is titled “Depiction element,” and “relates to a depiction element having a substrate with a surface region in which a plurality of optical elements are arranged,” “creating a depiction element . . . which has an attractive visual appearance” and “a high level of protection against counterfeiting” that is “easy for laypeople to check for authenticity.” Ex. 1006, code (54), ¶¶ 1, 8. Figures 8(a) and 8(b), reproduced below, depict embodiments in which a curved concave mirror is broken down into micro-optical elements with a square base and a flat mirror surface:

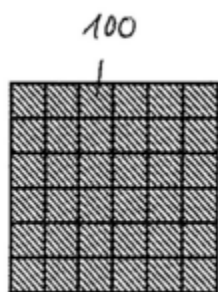


Fig. 8(a)

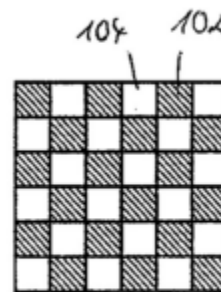
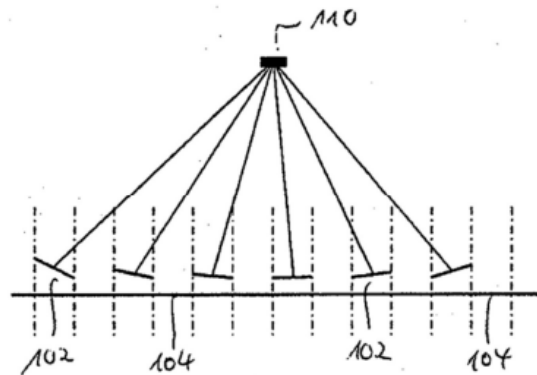


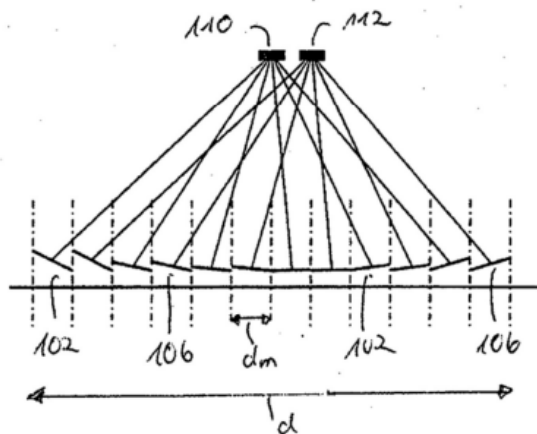
Fig. 8(b)

Figures 8(a) and 8(b) depict a concave mirror for producing a light spot being replaced by an arrangement of $n \times n$ micromirrors 100, which are arranged next to one another without any distance between them in the surface of the security element. *Id.* ¶ 87. Figure 8(b) depicts that the micromirrors 102 are arranged in a checkerboard-like manner in the surface region of the security element, so that every second mirror position remains free. *Id.* ¶ 88.

Figures 9(a) and 9(b), reproduced below, depict the checkerboard-like arrangement depicted in Figure 8(b), above, covered with micromirrors:



(a)



(b)

Fig. 9

Figure 9(a) depicts an intermediate step with only one micromirror group, and Figure 9(b) depicts complete covering with two micromirror groups for two closely adjacent light spots. *Id.* ¶ 49. In Figure 9(a), the micromirrors 102 covering every second field produces first light spot 110, and the “[m]icromirrors 102 form a group of micromirrors, which are all assigned to the same light spot 110 and produce it together when illuminated.” *Id.* ¶ 91. In Figure 9(b), “[f]ields 104 between micromirrors 102 are available for coverage with micromirrors that are assigned to other light spots,” and “fields 104 can be covered with micromirrors 106, which serve to produce a light spot 112 that is only one micromirror diameter . . . away from first light spot 110.” *Id.* ¶ 92.

2. *Analysis of Claim 1*

Petitioner contends that Fuhse262 renders obvious the preamble and limitations 1a–1b.6. Pet. 16–34. Petitioner supports its arguments with citations to Fuhse262 and to the testimony of Dr. Hesselink. Other than in two instances, discussed below, Patent Owner does not separately dispute Petitioner’s contentions regarding these limitations. At this stage of the proceeding, we determine Petitioner has sufficiently shown that Fuhse262 teaches the limitations of claim 1.

a) Preamble and Undisputed Limitations 1a–1b.4

Petitioner contends Fuhse262 teaches the preamble² by disclosing a depiction element for security applications (“visual display assembly useful as a security element”) such as for banknotes (“paper . . . currency”). Pet. 17

² Petitioner argues that the preamble is not limiting. Pet. 16. Because we determine Petitioner has shown sufficiently for purposes of institution that the prior art satisfies the recitation in the preamble, the issue of whether the preamble is limiting need not be resolved at this stage.

(citing Ex. 1006 ¶¶ 8–12; Ex. 1003 ¶¶ 116–120). Petitioner contends Fuhse262 teaches limitations 1a, 1b.1, and 1b.2 by disclosing a substrate with an array of micromirrors that display an image composed of a plurality of light spots (“pixels”) floating above or below the surface of the substrate. Pet. 17–23 (citing Ex. 1006 ¶¶ 1, 10–13, 15, 22, 30, 35–36, 54–65, 68, 82–95, 110, 125–128, Figs. 2, 8; Ex. 1003 ¶¶ 121–142). According to Petitioner, Fuhse262 teaches limitation 1b.3 by disclosing that groups of optical elements (“set of micromirrors”) are each assigned to different light spots and that Fuhse262’s micromirrors are permanently oriented, by being rotated about certain axes, to reflect light towards a light spot of the image. Pet. 23–29 (citing Ex. 1006 ¶¶ 10–11, 13, 19–20, 36, 60, 84, 88, 91–92, 95–101, 126–128, 144–145, Figs. 8a, 8b, and 9b; Ex. 1003 ¶¶ 144–157). Finally, Petitioner argues Fuhse262 teaches limitation 1b.4 by disclosing that its micromirrors receive and reflect the same ambient light concurrently to generate the light spots of the image. Pet. 29–31 (citing Ex. 1003 ¶¶ 158–165).

Patent Owner does not separately challenge Petitioner’s aforementioned assertions at this stage of the proceeding. *See* Prelim. Resp. We have reviewed Petitioner’s contentions and supporting evidence and we agree, for reasons summarized above, that Petitioner has demonstrated a reasonable likelihood that Fuhse262 teaches the preamble and the undisputed limitations 1a, 1b.1, 1b.2, 1b.3, and 1b.4.

b) Disputed Limitation 1b.5 – “and wherein a voxel is created at each of the points on the plane via intersection of two or more beams of the reflected ambient light”

For limitation 1b.5, Petitioner contends that Figure 10 of Fuhse262 shows “chief light rays” for each optical element converging on a light spot.

Pet. 31 (citing Ex. 1006 ¶¶ 95–97, Fig. 10). Petitioner notes that light reflects off the entire surface of the mirror, not just the center point, and thus light reflecting off the mirror forms a beam which consists of more than just the chief light ray. *Id.* (citing Ex. 1003 ¶ 170). According to Petitioner, the intersection of beams of light from the set of micromirrors converging on a light spot forms a “voxel.” *Id.* at 31–33 (citing Ex. 1003 ¶¶ 166–175). Petitioner contends that “[a] POSITA would understand [that] ‘voxels’ have a volume.” *Id.* at 31 (citing Ex. 1003 ¶¶ 167–168).

Patent Owner argues that Fuhse262 does not disclose voxels and does not teach or suggest the creation of pixels with volume. Prelim. Resp. 11. In fact, according to Patent Owner, “Fuhse262 does not use the term ‘voxel’ and does not mention ‘pixels with volume’ or ‘3D pixels’ or any similar term.” Prelim. Resp. 11. Patent Owner asserts that a “POSITA would understand Fuhse262’s consistent description of a pixel as an ‘image *point*’ as disclosure of a 2d pixel.” Prelim. Resp. 11–12 (citing Ex. 1006, 36, 95–97, 126–128).

Because Fuhse262 does not explicitly disclose voxels, Patent Owner surmises that Petitioner’s contentions are based on inherency and argues that Petitioner has not met the high standard required to show that Fuhse262 inherently discloses voxels. Prelim. Resp. 12. Specifically, Patent Owner argues that, at best, Petitioner has shown that the micro mirror array of Fuhse262 might result in overlapping light beams, but does not show how light beams overlapping would necessarily form a voxel especially if they overlap in an irregular or haphazard manner. Prelim. Resp. 13. Finally, Patent Owner argues that if voxels were necessarily the result of the Fuhse262 system, then all images produced by Fuhse262 would be three-

dimensional and the system would not be able to create two-dimensional images. *Id.*

At this stage of the proceeding, having reviewed Petitioner's contentions and Patent Owner's arguments to the contrary, we determine Petitioner has established a reasonable likelihood that Fuhse262 teaches limitation 1b.5. Dr. Hesselink testifies that while Fuhse262 depicts rays that form a light spot, the rays depicted are "chief rays" that depict only the center rays of light for each optical element. Ex. 1003 169–170. Ambient light, however, reflects from the entire surface of the mirrors and forms reflected beams of light, not just the center rays aimed at the center point. Ex. 1003 ¶ 170. The volume of the voxel is set by the intersection of these beams and the center of the voxel is the point at which the center rays of each beam intersect. Ex. 1003 ¶ 171. We determine Dr. Hesselink's testimony, which is unrebutted at this stage of the proceeding, explaining that light beams reflected from the entire surface of Fuhse262's micromirrors would create a voxel when they intersect with each other, provides sufficient support for Petitioner's contentions.

Patent Owner argues that light beams that intersect in an irregular manner would not necessarily form a voxel, but does not explicitly show that Fuhse262's light beams do, in fact, intersect in an irregular manner. Moreover, Patent Owner's argument is unsupported by expert testimony or other evidence at this stage of the proceeding and does not outweigh Dr. Hesselink's testimony under the reasonable-likelihood standard.

c) Limitation 1b.6 – “wherein each of the created voxels produces an effect of a point source of light floating above the surface of the substrate in the plane”

For limitation 1b.6, Petitioner contends Fuhse262 teaches limitation 1b.6 by disclosing a “light spot image composed of a plurality of light spots” and that the image “floats at a certain height above . . . the substrate surface.” Pet. 33 (citing Ex. 1006 ¶¶ 10, 11, 15, 35, 58–59, 63–69, 83, 89; Ex. 1003 ¶ 177). Petitioner argues that voxels produce an effect of a point source of light when a cone can be described in which the voxel is the cone’s apex and the micro mirrors are within the base of the cone and that Fuhse262 teaches exactly that. Pet. 34 (citing Ex. 1006 ¶¶ 36, 126; Ex. 1003 ¶¶ 178–180).

Patent Owner asserts that even if Fuhse262 did teach voxels, “it would not teach or suggest voxels that produce the effect of a ‘point source of light.’” Prelim. Resp. 14. Patent Owner argues that “Petitioner does not explain why a POSITA would understand that the ‘light spots’ of Fuhse262 would necessarily ‘produce[] an effect of a point source of light,’ as required by element [1b.6].” *Id.* at 15. Patent Owner characterizes Petitioner’s arguments as based on improper hindsight bias because, according to Patent Owner, Dr. Hesselink relies on the ’294 patent to inform his conclusion that Fuhse262’s voxels produce a point source of light by being at a cone’s apex with micro mirrors within the base of the cone. *Id.* at 16 (citing Ex. 1003 ¶ 180). Finally, Patent Owner asserts that the ’294 patent does not stand for the proposition that every voxel formed by mirrors in the base of a cone will produce an effect of a point source of light. *Id.* at 17. Rather, according to Patent Owner, the ’294 patent states that the specific micro mirror based visual assemblies disclosed in the ’294 patent’s specification achieve that

result and that “the Petition does not make a showing that the system of Fuhse262 discloses the same structure as that disclosed by the specification of the ’294 patent.” *Id.*

At this stage of the proceeding, having reviewed Petitioner’s contentions and Patent Owner’s arguments to the contrary, we determine Petitioner has established a reasonable likelihood that Fuhse262 teaches limitation 1b.6. Fuhse262 discloses that its image is a “light spot image composed of a plurality of light spots” (Ex. 1006 ¶ 10) and that this image “floats at a certain height above . . . the substrate surface” (Ex. 1006 ¶ 68). Further, Dr. Hesselink provides unrebutted testimony that because light rays continue on their paths until disturbed, the light rays depicted in Fuhse262’s Figure 10 would produce an effect of a point source of light when those continuing light rays reach the viewer’s eye. Ex. 1003 ¶ 178. We determine that the cited portions of Fuhse262 along with Dr. Hesselink’s unrebutted testimony provide sufficient support for Petitioner’s contentions.

We disagree with Patent Owner’s argument that Petitioner does not explain its position or that Petitioner relies on hindsight bias. Instead, as we summarized above, Petitioner provides sufficient explanation with support from Fuhse262 and from Dr. Hesselink’s testimony establishing a reasonable likelihood that Fuhse262 teaches this limitation.

Finally, we also disagree with Patent Owner’s argument that Petitioner has not shown that Fuhse262 contains the specific structure required for Fuhse262’s light spots to produce an effect of a point source of light. Dr. Hesselink testifies that a voxel produces an effect of a point source of light when a cone can be described in which the voxel is the cone’s apex and the micro mirrors are within the base of the cone. Ex. 1003 ¶ 180. Dr. Hesselink further testifies that Fuhse262 teaches such a cone with micro

mirrors within the base of the cone. Ex. 1003 ¶ 180 (citing Ex. 1006 ¶¶ 36, 126). We find Dr. Hesselink's testimony to be credible at this stage of the proceeding and to sufficiently show that Fuhse262 contains the specific structure to produce the claimed effect of a point source of light.

3. *Conclusion – Claim 1*

Based on the current record, there is a reasonable likelihood that Petitioner will prevail in demonstrating that claim 1 is unpatentable as obvious over Fuhse262.

4. *Analysis of Independent Claims 28, 35 and Dependent Claims 6–13, 32, 33, and 36–38*

Petitioner notes that independent claims 28 and 35 are similar to independent claim 1 and relies, to a large extent, on its contentions for claim 1. Pet. 34–44. Petitioner also addresses those limitations of independent claims 28 and 35 that differ from claim 1. Pet. 35–43 (addressing limitations 28b.2–28b.4, 35b.3, 35b.5). Petitioner addresses each of the limitations of dependent claims 6–13, 32, 33, and 36–38 providing support from Fuhse262 and Dr. Hesselink's testimony. Pet. 52–64. Because Petitioner demonstrates a reasonable likelihood of success in proving that at least one claim of the '294 patent is unpatentable, we institute on all grounds and all claims raised in the Petition. *See* 37 C.F.R. § 42.108(a). Therefore, at this stage of the proceeding, it is not necessary for us to provide an assessment of every claim in the ground challenged by Petitioner, especially, as in this case, when Patent Owner does not separately argue those claims. Those challenges, in our view, are best left for trial after full development of the record.

E. Remaining Grounds 2–8

Petitioner argues claims 1, 6–13, 28, 32, 33, and 35–38 of the '294 patent would have been obvious over Fuhse262 and Fuhse925 (Ground 2), Fuhse262 and Jordan (Ground 3), Fuhse262, Fuhse925 and Jordan (Ground 4. Pet. 44–64. Petitioner argues claims 14, 34, and 39 would have been obvious over Fuhse262 and Fuhse172 (Ground 5), Fuhse262, Fuhse925, and Fuhse172 (Ground 6), Fuhse262, Jordan and Fuhse172 (Ground 7) and Fuhse262 Fuhse295, Jordan, and Fuhse172 (Ground 8). Pet. 64–68. Below we provide a brief overview of these additional prior art references.

1. Fuhse925 (Ex. 1008)

Fuhse925 is titled “Visually Variable Security Element,” and “relates to an optically variable security element for securing valuable articles.” Ex. 1008, code (54), 1:5–6. Fuhse925 discloses an optically variable security element in the form of a window security thread that emerges at certain window regions, specifically the occurrence of a three-dimensional appearance and a movement effect when the security element is tilted. *Id.* at 6:49–55, 7:10–12. Fuhse925 explains an embodiment with ray-optically effective reflective facets 30 that constitute small included micromirrors that direct incident light in a reflection direction given by the condition ‘angle of incidence equals angle of reflection,’” and this “arrangement of the reflective facets 30 is . . . also referred to as a micromirror arrangement.” *Id.* at 7:43–48.

2. Jordan (Ex. 1009)

Jordan is titled “Moiré Magnification Systems,” and relates to “[i]ntegral image and moiré magnification devices” that “have been employed to provide authentication of currency and documents, to identify and distinguish authentic products from counterfeit products, and to provide

visual enhancement of manufactured articles and packaging.” Ex. 1009, code (54), ¶ 35.

3. *Fuhse172 (Ex. 1035)*

Fuhse172 is titled “Security Element, Value Document Comprising Such a Security Element, and Method for Producing Such a Security Element,” and “relates to a security element for a security paper, value document or the like, to a value document having such a security element, and to a method for manufacturing such a security element.” Ex. 1035, code (54), ¶ 1. Fuhse172 discloses forming color-shifting coating on facets as a thin-film system or thin-film interference coating, as an interference filter, or as liquid-crystal layer, and that the color-shifting coating on facets can be constructed of reflector, dielectric, absorber (formed on the facets). *Id.* ¶¶ 27–29.

4. *Analysis of Grounds 2–8*

Because Petitioner demonstrates a reasonable likelihood of success in showing that at least one claim of the ’294 patent is unpatentable, we institute on all grounds and all claims raised in the Petition. *See* 37 C.F.R. § 42.108(a). Therefore, at this stage of the proceeding, it is not necessary for us to provide an assessment of every challenge raised by Petitioner, especially, as in this case, when Patent Owner does not separately argue these grounds. Those challenges, in our view, are best left for trial after full development of the record.

III. CONCLUSION

Petitioner has demonstrated a reasonable likelihood of prevailing in showing the unpatentability of at least one challenged claim of the ’294 patent and we institute on all grounds raised and all claims challenged in the

Petition. At this stage of the proceeding, however, we have not made a final determination with respect to the patentability of the challenged claims.

IV. ORDER

For the foregoing reasons, it is

ORDERED that, pursuant to 35 U.S.C. § 314(a), an *inter partes* review of claims 1, 6–14, 28, and 32–39 of the '294 patent is instituted with respect to all grounds of unpatentability set forth in the Petition; and

FURTHER ORDERED that, pursuant to 35 U.S.C. § 314(c) and 37 C.F.R. § 42.4(b), *inter partes* review of the '294 patent shall commence on the entry date of this Order, and notice is hereby given of the institution of a trial.

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